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MANITOBA MAPLE - AN UNTAPPED RESOURCE

A PRELIMINARY REPORT ON THE FEASIBILITY OF DEVELOPING A VIABLE INDUSTRY IN THE CANADIAN PRAIRIE PROVINCES BASED UPON THE UTILIZATION OF PRODUCTS DERIVED FROM THE SAP OF MANITOBA MAPLE (*ACER NEGUNDO* L.)

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INTRODUCTION

This paper will explore, at a preliminary level, the feasibility of developing in Manitoba and Saskatchewan a small-scale industry which would use the sap of the Manitoba maple (*Acer negundo* L.) as the natural resource to produce and market a variety of consumer products.

In examining the potential of Manitoba maple, this report will review the following areas: the history of the product; existing studies on maple syrup products; and current use and production of syrup products from Manitoba maple. Particular emphasis will be placed on the marketing potential of syrup products from the Manitoba maple. The potential for development of such products, therefore, will be viewed in the context of the marketing mix, which includes pricing, promotion and distribution considerations. Each of the components of the marketing mix will be addressed in order to fully examine the potential of this unique line of products.

To justify the financial and technical support which will be required by government, there must be a perceived need to diversify the incomes of woodlot owners, farmers, and native people in the region. If this need exists, the establishment of such an alternative industry in Manitoba and Saskatchewan should be considered.

THE SILVICS OF MANITOBA MAPLE

Manitoba maple (*Acer negundo* L.) is native to the southern half of Manitoba and Saskatchewan and parts of eastern Alberta and southwestern Ontario. It grows naturally on deep, well-drained, moist alluvial sites, and is most commonly found on lakeshores and in valleys surrounding rivers and streams. Because it is fast-growing and winter-hardy, it is frequently planted as an ornamental or shade tree both in cities and in farmyards, and as a windbreak.

Frequently referred to as box elder or ash-leaved maple because of its compound leaf, open-grown Manitoba maple usually has an irregular form, with the main stem dividing near the ground, resulting in a large, uneven crown. The tree is relatively short-lived. Diameters rarely exceed 60 cm, and heights in excess of 15 m are uncommon. Its current utilization is limited to rough construction, and, locally, in the manufacture of crates and boxes.

AN HISTORICAL PERSPECTIVE

There is considerable evidence that, for centuries, Manitoba maples in the prairie provinces were tapped to produce maple syrup. Whether the techniques were learned from native people or were the result of translocation of Quebec voyageurs to the west is unknown. According to the journal of Daniel Williams Harmon, a partner in the Northwest Company, the sap of Manitoba maples was used at the beginning of the 19th century to produce sugar, the quality of which he referred to as inferior to that of the sugar maple. In his diaries Harmon makes several references to collecting sap from mid-March to mid-April in the Alexandria and Swan River areas of Manitoba's upper Assiniboine Valley. His account is believed to be the first written documentation of the use of the sap of the Manitoba maple for sugar.

Several other scholars writing in the late 19th century cite the use of Manitoba maple for syrup and sugar by native people as early as 1783. In fact, the Cree name for sugar, ***sisibaskwat***, is likely derived from their name for the maple tree, ***sisibaskwatattik***.

COMPARATIVE RESEARCH

In 1967, the Ontario Department of Lands and Forests released the results of a study on the use of five maple species as a source of sap and maple syrup: sugar (*Acer saccharum* Marsh); red (*A. rubrum* L.); Norway (*A. platanoides* L.); silver (*A. saccharinum* L.) and Manitoba (*A. negundo* L.).

The study was conducted between 1964 and 1965. The first series of tests were initiated in 1964 at the research laboratory of the agricultural department at the University of Guelph. Over 600 samples of five maple species were evaluated for sugar content, range in concentration, and quality of sap and syrup. The following is a summary of the results.

It was found that the range of sugar concentration (primarily sucrose) in the sap from street-planted Manitoba maples was 2.2 to 4.8%, with an average of 3.3%. The results compare favorably with the test results for the other four maple species:

	Average Sugar Concentration (%)	**Range (%)**
Norway (street-planted)	3.3	1.9 - 5.3
sugar (woodlot-grown)	2.6	1.4 - 4.2
red (woodlot-grown)	2.4	1.2 - 4.4
silver (woodlot-grown)	2.1	1.1 - 3.6

The tests were repeated in 1965 with the following results:

	Average Sugar Concentration (%)	**Range (%)**
Manitoba (street-planted)	2.1	1.0 - 6.3
Norway (street-planted)	2.9	1.8 - 4.9
sugar (street-planted)	3.9	1.5 - 3.6
sugar (woodlot-grown)	2.4	1.4 - 4.9
silver (woodlot-grown)	1.9	1.3 - 3.4

The researchers concluded: "In addition to hard maple, the other four maple species may also be regarded as potential syrup producers."

During the same period taste tests were undertaken by staff members, who concluded that 97% of the Manitoba maple sap sampled had a pleasant taste. These tests, although subjective, indicated that the sap of Manitoba maple compared favorably to that of sugar maple (rated 93% pleasant).

Further research into the quality of syrup produced from the five species of maple was carried out in 1964. Results revealed much higher concentrations of nitre, or sugar sand, in the syrups of Manitoba, sugar, and

Norway maple, than in the syrups of silver and red maple.

In 1965, the researchers in the Ontario study also conducted flavor tests of syrups from Manitoba, sugar and Norway maples. The tests involved a panel of 50 judges. The results of this preference rating are as follows:

21% rated Manitoba first
18% rated Manitoba second
61% rated Manitoba third

When the judges were asked to consider whether the three syrups possessed a natural or artificial flavor, the results were approximately equal: about two-thirds of the judges considered all three syrups to have a natural flavor.

The judges were also asked to determine if the three syrups had a "distinctly pleasant" taste. Manitoba scored last in this rating, but still a respectable 73% of the judges agreed that it had a pleasant flavor.

The Ontario report stated: "Evaluation of ... Manitoba maple for syrup production showed that this species is capable of producing sap with considerable sugar content from which agreeably tasting syrup can be manufactured."

The report concludes, "Considerable thought should be given by agriculturists and foresters to the possibility of establishing fast-growing and high-yielding stock on a large scale, along fence rows and as plantations on marginal agricultural land. This practice . . . would not only supply additional revenues to the often marginally operated farms, but the trees would also serve as windbreaks, provide shade for livestock and generally contribute to the real and aesthetic value of the farm . . . . Woodlots used for maple syrup production bring in more revenue than if managed for lumber or charcoal only."

This latter point bears further examination. Shelterbelts and windbreaks on the prairies not only serve to reduce soil erosion, but also provide valuable wildlife habitat. Manitoba maples incorporated as a component of such windbreaks serve not only as environmental buffers, but as an alternative source of income to the farmer in the off-season. This approach is consistent with the concepts of multiple use, integrated resource management, and in a more general sense, sustainable development.

It is estimated that in southern Saskatchewan several million Manitoba maples have been planted in shelterbelts and windbreaks since the turn of the century. These large-canopied trees represent undoubtable potential for maple syrup operations.

EXAMPLES OF MAPLE OPERATIONS IN WESTERN CANADA

While there is in western Canada no large-scale syrup industry based on Manitoba maple, there are several examples of small-scale operations which indicate its potential.

Trappist monks in Holland, Manitoba have been successfully producing Manitoba maple syrup since 1983, with annual production varying from 500 to 600 L of syrup. The monks annually tap 1,000 to 1,200 trees, with sap-to-syrup ratios between 32:1 and 42:1, comparable to ratios experienced with sugar maple in Quebec, Ontario and the Maritimes.

According to staff at the Manitoba Department of Natural Resources, the Holland operation, although primitive in comparison to some of the more sophisticated operations found in eastern Canada, is both productive and profitable. Sap is collected via spiles and pails, although there has been some experimenting with plastic tubing and gravity collection. The sap is evaporated in a 4 ft by 4 ft baffled evaporating pan mounted on a cement and

metal wood stove. The stove is set inside a homemade A-frame structure made of sheet metal.

The Holland maple bush is generally unmanaged. Open-grown Manitoba maples, primarily those growing in low areas and near creeks, are tapped in late February, with the sap run usually commencing in late March and lasting until the end of April or early May. As with eastern Canadian operations, weather dictates the extent and duration of the sap run. Minimum diameter for tapping is 15 cm, compared with the average of 22 cm for sugar maples in the east.

Cecil and Gwen Machnee of Canora, Saskatchewan report similar findings from their community. They run their operation as both as a hobby and an experiment. From April 2 to April 27, 1990, the Machnees produced 5 L of syrup with a 24:1 sap-to-syrup ratio. A local development committee in Canora is currently exploring the feasibility of including Manitoba maple syrup in a product line of other natural foods such as wild mushrooms and Saskatoon berries.

A volunteer group involved with a historical museum in St. Pierre, Manitoba annually taps about 400 trees, with results similar to the operation at the Holland monastery. In addition to syrup, the group produces maple butter and candies which are marketed at their annual Festival du Voyageur.

Ken Vipond of Winnipeg participates annually in a small maple operation. His experience over a number of years has indicated a normal sap-to-syrup ratio of 40:1. Mr. Vipond indicates the biggest problem is the variability of weather in the spring. Although he has witnessed sap runs as early as mid-February, his findings concur with those previously discussed, i.e., an April run is most common.

MARKETS FOR TRADITIONAL MAPLE SYRUP

Worldwide there is an unlimited market for maple products. Maple syrup is successfully marketed internationally, not only in North America, but also in Germany, Australia, Japan, and approximately 30 other countries. Current production is centered in eastern North America. Eleven thousand producers in the province of Quebec supply approximately 90% of Canadian production and over 70% of worldwide production, generating average annual revenues of $70 million. The provinces of Ontario, New Brunswick and, to a lesser extent, Nova Scotia comprise the remaining areas of Canadian production. In the United States, New England is the primary production center, but there are viable maple operations as far west as Minnesota.

The traditional eastern producer collects sap by bucket or pipeline, evaporates it at a small processing facility, bottles it, and retails it at the camp or roadside, or through local retail outlets. There are also some producers whose operations consist of sap collection only, the raw sap being sold locally in bulk to larger producers.

In eastern Canada many producers limit their operations to the production of bulk syrup which is sold in barrels to private central manufacturing plants. Approximately 80% of Quebec production is sold in this manner to three major processors: Borden's, Heinz, and the Quebec Maple Producers Co-operative at Plessisville.

There are, as well, a few individual entrepreneurs in Quebec and Ontario who have actively researched and developed new products and packaging, and have undertaken serious marketing efforts nationally and internationally. The Herman family of the Quebec Eastern Townships, using the brand name Turkey Hill, is perhaps the most innovative and progressive marketer of maple syrup products.

MARKETING MANITOBA MAPLE SYRUP

It should be stated at the outset that it is unlikely, but not impossible, that the production of syrup from Manitoba maple may become a large-scale industry in western Canada. However, its potential as a profitable enterprise for prairie woodlot owners, farmers, and native people is significant. As a supplementary and complementary entrepreneurial activity, the production and marketing of Manitoba maple syrup shows great promise. At present it may be considered an "untapped" resource.

In considering the marketing potential of a product, one must examine the four basic components of marketing: the product, the price structure, promotional strategy, and the distribution system -- the marketing mix. An examination of the marketing potential of Manitoba maple products within this context will prove fruitful.

Product

It is apparent from the long history of the use of Manitoba maple for sugar products, from the research undertaken by the Ontario Department of Lands and Forests, and from the current examples of small-scale sugaring operations, that there is little doubt a product or product line can be developed using the sap of the Manitoba maple as the natural resource. It is also apparent that this product has sufficient consumer appeal to merit serious marketing efforts.

Further research, however, is necessary to examine the transfer of eastern Canadian technology to the biological, climatic and sociological realities of the west. The difference in species, climate, sites, soils, spring weather patterns, terrain, etc. would indicate that a wholesale transfer of eastern systems would be simplistic. Although the fundamental biological processes are the same, i.e., spring tapping of the maple genus -- and sufficient research has been undertaken to prove that they are -- there will inevitably be a need to adapt the processes to western conditions. Such adaptation will require further on-site research under western conditions.

This is not to suggest, however, that one must re-invent the wheel. It is quite likely, and indeed there is physical evidence, that most eastern processes can readily be adapted to western conditions. But before woodlot owners, farmers, and native people are encouraged to invest in maple operations, it would be prudent to establish a number of experimental/demonstration operations under typical western conditions. Perhaps one operation based on southern Manitoba agricultural conditions where Manitoba maple grows and regenerates naturally, and a second based on Saskatchewan shelterbelt conditions would be sufficient to represent the broad potential in these provinces. Such experimental operations might examine the economic and technological aspects of operations using the bucket system, pipelines, vacuum pumps, and reverse osmosis machines. Investigations into minimum tapping diameters, tree spacing, sugar bush management practices, and the impact of insects and disease would provide valuable information on the potential of the resource.

Experimentation with other products derived from syrup -- maple butter, candies, creams, chocolates, candied popcorn, wine, cotton candy, and extracts -- would assist in developing a complete product line and prove invaluable to individual producers in establishing viable operations.

Developing a brand name is one aspect of the product which merits considerable attention. Should the generic name for the product distinguish it from its eastern competition, or should it simply be called *maple syrup*? According to federal Maple Product Regulations under the Canada Agricultural Products Standards Act, *maple product* means any product obtained directly or indirectly from maple sap. There is no reference to specific species of maple.

But are there marketing advantages in distinguishing the western product from that of the sugar maple? If so, is *Manitoba maple* the appropriate generic name? Does it conjure up the right image in the eyes of the consumer? The average consumer might not understand that Manitoba maple syrup is derived from the Manitoba maple species and may assume that the product originates in only one province, thus creating a problem to Saskatchewan producers.

Other generic names with marketable appeal might be considered. Such names as *Prairie Maple Syrup* or *Western Maple Syrup* or *Plains Maple* or *Prairie Gold Maple Syrup* might be considered. The use of focus groups to determine the most marketable generic name for the product is strongly recommended.

Packaging and container size are key to the image of the product because they reflect the relative value of the product. For example, French perfume and caviar are marketed by the ounce; gasoline, liquid bleach and vinegar are sold in 5-L containers. Manitoba maple syrup should never be marketed merely as a commodity: it is an upscale, luxury item and must be marketed as such. Container size, therefore, must reflect the product's uniqueness and relative scarcity, as well as the significant investment in equipment and labor to produce the product. "Small is beautiful" is the operative formula. Marketing of maple syrup in large containers such as 5-L cans conveys the image to the consumer that the product is abundant and is therefore less valuable than items packaged in smaller containers.

For Manitoba maple syrup, even litre-sized containers should be avoided, except for lower grades and end-of-season runs. Containers of 375 mL and smaller should be the norm. Packaging should further enhance the image of novelty, quality, and scarcity and should convey the care, craftsmanship, and personal touch necessary to produce the product.

Pricing Structure

In 1991 Forestry Canada staff conducted a cursory survey of retail prices for eastern Canadian maple products sold in Saskatchewan. The results are as follows:

	375 mL
#1 Amber	$5.19
#2 Amber	$5.99
	$6.19
	$5.79
	$6.39
#1 Medium	$6.19
	$5.87
	Range $5.19 - $6.39/375 ml

The Manitoba Department of Natural Resources reports that the monastery at Holland, Manitoba retails its Manitoba maple syrup at $4.50 for 250 mL and $7.50 for 500 mL, packaged in what is described as "attractive plastic bottles". These figures represent a retail price of approximately $6.00 for a 375-mL bottle, comparing favorably with the average price of $5.79 for sugar maple syrup from eastern Canada. Based on this rather limited evidence, it would appear that syrup from Manitoba maple can command prices similar to those for sugar maple syrup from eastern Canada, and that consumers are willing to pay such prices.

Neither the prices for Manitoba nor for sugar maple syrups compare favorably with those for artificial table syrups, which average approximately $1.75 for 375 mL, based on a retail price of $2.89 to $3.89 for 750 mL. However, many consumers appear willing to pay considerably more for genuine maple syrup.

Clearly the pricing strategy must be based on a reasonable profit margin. The initial start-up capital expense of establishing a maple bush and processing facility; the amount of work required; and the necessary costs of packaging, transportation, and promotion must be factored into the establishment of a pricing structure. The

final product must command a price which reflects the above costs, plus the skills and expertise to produce a fine product. Moreover, pricing must take into account the relative scarcity of the product, i.e. the law of supply and demand.

A marketing strategy will necessitate the positioning of the product as a luxury or gourmet item, just as shitaake mushrooms, caviar, and lobster are positioned. A product which requires the inputs listed above cannot be expected to compete in price with mass-produced artificial table syrup. There is a distinct niche for the marketing of Manitoba maple syrup products, and the corresponding price must enhance the image associated with such a product.

Promotion

As has already been discussed, the product, packaging and pricing must be designed to fill a niche currently insufficiently met by existing products in the consumer market. In order to evaluate the promotional potential of Manitoba maple syrup, it is necessary to review the product's attributes.

Manitoba maple syrup is a product of the prairies, and can therefore be promoted to those who wish to purchase locally produced products vs. those from eastern Canada. It is a pure and natural product with no artificial preservatives or additives, thus appealing to the health-conscious set. According to the research, its flavor compares favorably with that of eastern Canadian maple syrup. The product is unique and novel, and therefore potentially trendy to a specific market segment searching for unusual food products. In addition, its current price compares favorably with eastern Canadian competitors.

The above attributes should form the basis for the promotion of Manitoba maple products.

The Plessisville Co-operative in Quebec recently conducted a North American consumer survey to determine alternate uses for maple syrup. Among the most common suggestions were its use in pies, fruit salads, lemonade, and on grapefruit and sundaes. Like honey, Manitoba maple syrup can be promoted as a healthy, unique and natural alternative sweetener in recipes. A Manitoba maple cookbook would enhance its marketability. In the east, private publishers and several departments of agriculture have issued maple products cookbooks which expand the realm of usage. It is recommended that extension branches of the departments of agriculture for the western provinces be approached to research and develop new recipes to be incorporated into a Manitoba maple cookbook.

In-store sales promotion materials should be designed to reflect the image of the product. Display units made of wood, perhaps box elder, would enhance the earthy or natural appeal of Manitoba maple syrup, and serve as an incentive to retailers to carry the product line. Point-of-purchase merchandisers featuring smaller bottles of syrup or pieces of maple candy displayed at the cash or check-out counter could attract the impulse buyer.

Tent cards advertising the availability of maple syrup as an optional topping for pancakes, waffles and sundaes, are a proven success in restaurants. Similarly, paper placemats describing the product and its history could serve as an additional promotional item.

Advertising in newspapers, magazines and the broadcast media tends to be expensive, but an alternative, more economical approach would be the provision of news articles to the media on this "new" industry and its products. A pamphlet providing recipes, a list of producers, and a description of the industry and its history could be distributed through provincial tourism and forestry offices, as well as retail outlets.

These are just a few suggestions for the promotion of Manitoba maple syrup products; there are countless other local opportunities. With a sound promotional strategy, a line of Manitoba maple products could capture the imagination of both local residents and tourists alike.

Distribution

The final component of the marketing mix is distribution. In other words, what are the most appropriate outlets for such a product line?

As mentioned previously, many Quebec maple producers market their products directly to the consumer at the maple camp. Visitors are attracted by the opportunity to tour a sugaring operation, see the processes, and sample the various products. Taffy-on-the-snow is an annual attraction in which thousands of Quebecois participate, as families drive many miles to spend a day in the country, walk through a sugarbush, take a sleigh ride, and purchase their annual supply of maple products. Many eastern Canadian operators welcome bus tours of school children, senior citizens and other groups. Dinner or brunch at a maple camp, featuring pancakes, beans and other Quebecois fare is most common. Some producers indicate that these tourist operations are more profitable than the selling of the maple products themselves. The opportunity to retail directly to the consumer, of course, increases the profit margin to the producer.

Another example of direct-to-the-consumer marketing is the traditional roadside stand, whereby younger family members often retail the merchandise. Likewise, farmers' markets are ideal venues for selling Manitoba maple products.

Special events, such as western rodeos, country fairs, and powwows provide more opportunities to market not only syrup and sugar, but other products such as maple cotton candy, maple popcorn, and taffy-on-the-snow.

Maple festivals have proven exceedingly popular in many communities in eastern Canada, allowing maple producers' associations and co-operatives to stage weekend events which attract thousands of visitors, elevate the profile of the industry, and market a variety of maple products.

Alternatively, distribution through established retail outlets allows producers to limit their marketing involvement by functioning strictly as wholesalers. Such outlets should be selected for their compatibility with the image of maple products, and should feature products which are complementary.

Marketing at the supermarket level might prove difficult for a number of reasons. First, Manitoba maple is a new and novel product, and chains are generally reluctant to risk new products without substantial promotional incentive. Second, competing eastern Canadian maple products may be centrally purchased for national distribution, and the business links between manufacturers and retailers are long established. Third, the image of the product as an upscale luxury item may not befit the supermarket setting, unless the product is displayed in the gourmet section of the store.

But no avenue for marketing should be left unexplored. The fact that the product is locally produced may indeed influence some store buyers to take the risk. As well, lower grade syrups and those from end-of-season runs with a slight buddy or caramel flavor, in less expensive packaging and at competitive prices might be well received by the chains.

There are many other retail possibilities for Manitoba maple syrup. Natural and health food retailers would find this product line consistent with their image of chemical-free products derived from natural sources. Alternatives to traditional white sugar which are natural in origin are uncommon. Like honey, Manitoba maple syrup can be marketed as a natural alternative sweetener in recipes. The availability of maple syrup cookbooks would assist greatly in the marketing effort.

Manitoba maple products are an ideal tourism product, as a novel souvenir, gift or collectible purchased during a visit to the prairies. For this reason, airport gift shops, shops at provincial and national parks, native people's shops, art galleries, upscale souvenir boutiques, and gourmet shops are all outlets that would appropriately suit the image of a product with such unique characteristics. Manitoba maple syrup can be marketed wherever wild rice, honey, homemade Saskatoon preserves and jams, wild mushrooms, and similar products are sold. In other words, wherever "shop" is commonly spelled "shoppe", Manitoba maple products can be readily marketed.

The restaurant and dining room component of the tourism industry is yet another potential market. In many Vermont establishments customers are offered, for an additional charge, genuine maple syrup with their pancakes and waffles. The syrup may be sold to restaurants in bulk or in tiny one-serving bottles. Positioning of these bottles at the cashier's desk allows customers to take home more of the products they have just tasted.

These are only some suggestions for distribution of the product, in line with the image and niche described in the sections on product, packaging, pricing and promotion. Doubtless there are others, such as export marketing and direct mail. What is apparent is that there is considerable marketing potential for such a product line.

SUMMARY

In this brief and preliminary report, an attempt has been made to outline the potential for the establishment of a Manitoba maple product industry in Manitoba and Saskatchewan. Such an industry would clearly provide an economic stimulus to the economies of both provinces, as well as providing an alternative source of income to farmers, woodlot owners and native people.

Historical reports show that Manitoba maples can be tapped to produce maple sugar products. Ontario taste tests indicate that Manitoba maple syrup compares favorably with that of other maple species. There exists at present in Manitoba and Saskatchewan large numbers of both naturally occurring and planted Manitoba maple.

If such an industry were established, the marketing potential for Manitoba maple products would be strong. Practical research via a number of pilot operations would be prudent, however, in order to explore unforeseen problem areas and verify the evidence currently available.

The following is a list of recommendations which outline the next step to be taken to develop such an industry.

RECOMMENDATIONS

1. It is recommended that there be established two experimental/educational/demonstration maple sugar operations of a scale equivalent to that of the "average" potential producer -- one located in a natural stand of Manitoba maples in southern Manitoba, the other in a Saskatchewan shelterbelt. The purpose would be twofold: first, to experiment with the transfer of eastern Canadian technology; second, to provide educational and demonstration opportunities for potential private producers.

2. It is further recommended that these experimental operations investigate the economic potential of western Canada operations through standard cost-benefit analysis.

3. It is recommended that funds to establish these operations be earmarked under the next round of federal-provincial forestry agreements.

4. It is recommended that a consultant be engaged to oversee the establishment of these operations, purchase of equipment, design and construction of camps, and preparation of a sugar bush management plan.

5. It is recommended that market research be undertaken to verify, under western conditions, the marketing strategy as outlined in the sections on product, pricing, promotion and distribution. Consumer research should include such aspects as product taste and quality, generic name, size of packaging, promotional strategy and point of purchase.

6. Should the experimental/educational/demonstration operations prove that such an industry is feasible,

and the market research indicate there is sufficient demand, it is recommended that financial assistance be provided to farmers, woodlot owners and native communities who have the biological potential, i.e. Manitoba maple stands, to establish such sugaring operations.

7. It is recommended that consultations take place with the Quebec Maple Producers Co-operators in Plessisville, Quebec with a view to exploring the feasibility of establishing a prairie maple producers co-operative with a similar structure.

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